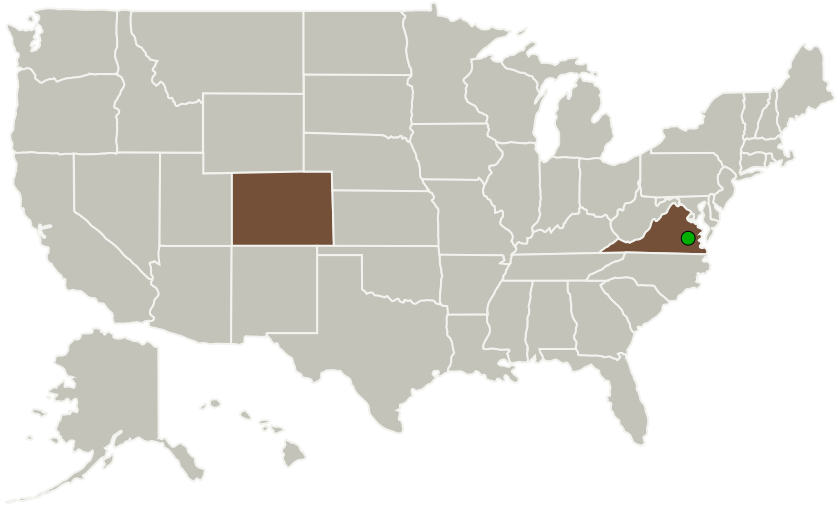
Shock Wave Boundary Layer Interaction Control Using Pulsed DBD Plasma Actuators, Phase I

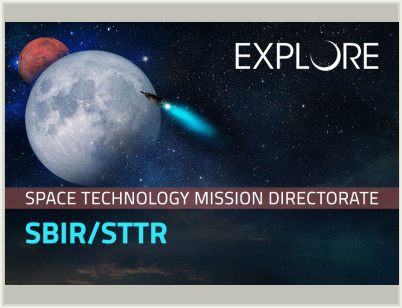
Completed Technology Project (2012 - 2012)

Project Introduction

Active flow control using dielectric barrier discharge (DBD) plasma actuators is an attractive option for both reduction of complexity of aircraft systems required for off-cruise operation and increasing reliability of future hypersonic vehicles. However, development of DBD plasma actuators has been rather slow due to the complexity and lack of understanding of physical processes associated with DBD operation and its interaction with the external flow. In order to widen the capabilities of the DBD plasma actuators and make them applicable to a number of NASA missions, including Supersonic and Subsonic Projects, it is necessary to develop a predictive methodology to optimize DBD systems based on complex understanding of plasma-flow interaction. We propose to develop full plasma/CFD experimentally validated modeling capability for DBD plasma actuators for the problem of Shock Wave Boundary Layer Interaction (SWBLI) control. During Phase I of the project we will develop a prototype simulation tool for SWBLI control system using DBD plasma actuators, demonstrate the feasibility of the proposed control approach both using numerical simulation and wind tunnel experiments at Princeton University and validate developed prototype against experimental and available numerical data.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Tech-X Corporation	Lead Organization	Industry	Boulder, Colorado
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Colorado	Virginia

Project Transitions

February 2012: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138497)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Tech-X Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

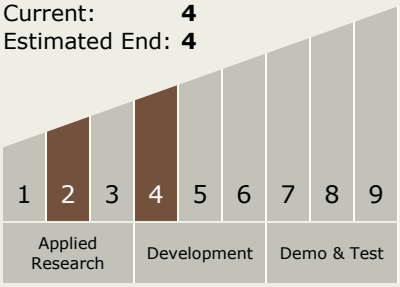
Carlos Torrez

Principal Investigator:

Alexandre Likhanskii

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.5 Propulsion Flowpath and Interactions

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System